

CA6694: GEOMECHANICS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Geomechanics

Subject Code

CA - Civil and Architectural Engineering

Course Number

6694

Academic Unit

Architecture and Civil Engineering (CA)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

The course introduces concepts and theories in geomechanics (soil and rock mechanics) and geotechnics. Analytical and empirical methods will also be introduced to solve geotechnical design problems. The course aims to foster a curiosity and an aptitude towards independent discovery about geotechnical structures and the behaviour of soils.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)		DEC-A2	DEC-A3
1	Explain the importance of specialized theories and analytical/empirical methodologies in geomechanics;			x	
2	Discuss specialized methods in experimental soil mechanics with emphasis on recent research progress internationally;		x	x	
3	Predict ground and geo-systems behavior under variable loading conditions;		x	x	
4	Characterize ground behavior using soil models;		x	x	
5	Discuss the need for an enquiring mind when new soils are encountered.		x	x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Students will engage in formal lectures to gain knowledge about geomechanics topics	1, 2, 3, 4, 5	
2	Tutorials	Students will engage in in tutorials to consolidate their knowledge gained from the lectures into practical problems	3, 4	

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Mid-term test	1, 2, 3, 4	20	
2	Assignments	1, 2, 3, 4	30	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

To pass a course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%

Assessment Rubrics (AR)

Assessment Task

Mid-term test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Assignments (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

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Assessment Task

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Mid-term test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

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(B+, B) Significant

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(B-, C+, C) Basic

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Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

ABILITY to DESCRIBE geomechanics and engineering geology concepts/theories and ANALYZE problems learnt in lectures and tutorials

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Part III Other Information

Keyword Syllabus

Critical state soil mechanics and its limitations, Nonlinearity of stiffness, Behavior of ideal materials, Behavior of natural soils and rocks, behavior of geo-systems, constitutive models, discrete and continuous materials, failure criteria, anisotropy, settlement analysis, site investigation, origins and characteristics of soils and rocks.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Bolton, M.D and K. (1998). A Guide to Soil Mechanics. Chung Hwa Books.
2	Coduto, D.P. (2001). Foundation Design: Principles and Practices. 2nd Ed. Prentice-Hall.
3	Craig, R.F. (2004). Craig's Soil Mechanics. 7th Ed. Spon Press.

4	Das B.M. (1999). Principles of Foundation Engineering. 4th Ed. PWS Publishing.
5	Geotechnical Control Office (GCO) (1984). Geotechnical Manual for Slopes. The Government of Hong Kong Special Administration Region, 2nd Edition, Hong Kong.
6	Geotechnical Control Office (GCO) (1987). Geoguide 2: Guide to Site Investigation. The Government of Hong Kong Special Administration Region. Hong Kong.
7	Geotechnical Control Office (GCO) (1987). Geoguide 3: Guide to Soil and Rock Descriptions. The Government of Hong Kong Special Administration Region. Hong Kong.
8	Geotechnical Engineering Office (GEO) (1993). Geoguide 1: Guide to Retaining Wall Design. 2nd Edition, The Government of Hong Kong Special Administration Region, Hong Kong.
9	Muir Wood, D. (1990). Soil Behaviour and Critical State Soil Mechanics. Cambridge University Press.
10	Powrie, W. (2004). Soil Mechanics: Concepts and Applications. 2nd Ed. Spon Press.
11	Atkinson & Bransby (1978). The Mechanics of Soils. McGraw-Hill
12	Atkinson (1993). An Introduction to the Mechanics of Soils and Foundations. Mc-Graw-Hill.
13	Mitchell, J. K. and Soga, K. (2005). Fundamentals of Soil Behavior. Wiley.